500-ME-12235

8-CHANNEL
DC AMPLIFIER

MODEL 48-8400-01
(& Portable Model 48-8400-02)

USER MANUAL

MP MASTER
MA34596

GOULD
Electronics

GOULD
Electronics

Manual Part No.
MU48-8400-01

8-CHANNEL
DC AMPLIFIER

MODEL 48-8400-01
(& Portable Model 48-8400-02)

USER MANUAL

The Model #48-8400-01/02 is a rack-mounted (or portable) preamplifier assembly, featuring individual channel input isolation, designed mainly as a signal conditioner for chart recorders, but also applicable as data acquisition front end. Meets IEC-348 specifications.

Gould Inc., Recording Systems Division

Printed 03-89

3631 Perkins Ave., Cleveland, Ohio 44114

1st Printing

Printed in U.S.A

ADDENDUM

CSP 6574

The Gould 8 Channel DC Amplifier, Model 48-8400-16574, is the same as the standard amplifier described in this manual except that a conductive coating has been applied to the back of the front panel and special nameplates per customer order are attached.

MARCH 29, 1990

ADDENDUM

CSP 6574

The Gould 3800 Recorder, Model 30-V8808-116574, is the same as the standard recorder described in this manual except that a conductive coating has been applied to the back of the front panels and special nameplates per customer order are attached.

MARCH 29, 1990

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SAFETY SUMMARY

The general safety information is for both user and service personnel. Specific **WARNINGS** and **CAUTIONS** will be found throughout the manual where they apply.

TERMS IN THIS MANUAL

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property. They will appear in boldfaced capital letters.

WARNING statements identify conditions or practices that could result in personal injury or loss of life. They will appear in boldfaced capital letters.

SYMBOLS IN THIS MANUAL

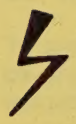
This symbol indicates where cautionary information is to be found.

TERMS AS MARKED ON EQUIPMENT

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property, including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS AS MARKED ON EQUIPMENT



DANGER - High Voltage.

Protective ground (earth) terminal.

ATTENTION - Refer to manual..

SAFETY SUMMARY
(Continued)

POWER SOURCE

This instrument is intended to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential.

GROUNDING THE INSTRUMENT

This instrument is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

DANGER ARISING FROM LOSS OF GROUND

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

USE THE PROPER POWER CORD

Use only the power cord and connector specified for your instrument. Use only a power cord that is in good condition. For detailed information on power cords and connections see Section 2, Installation, in the User's Manual.

USE THE PROPER FUSE

To avoid fire hazard, use only a fuse of the correct type, voltage rating and current rating as specified in the parts list for your instrument.

DO NOT OPERATE WITHOUT COVERS AND PANELS INSTALLED

To avoid personal injury and equipment damage, the user should disconnect power before removing covers, panels or any grounding straps. Reinstall covers, panels, and any grounding straps *before* reconnecting power.

WARNINGS FOR AUTHORIZED SERVICE PERSONNEL

Do not perform internal service or adjustment of this instrument unless another person capable of rendering first aid and resuscitation is present.

Dangerous voltages exist at several points in this instrument. To avoid personal injury, do not touch exposed connections or components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

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GENERAL INFORMATION

SCOPE OF MANUAL

This manual contains valuable information on the installation, operation, and maintenance of the Gould Model 48-8400-01 DC Amplifier. Knowledge of the manual contents will help the user maximize the features that the 48-8400-01/02 offers.

REMINDER

All information in this manual applies equally to rack model (#48-8400-01) and portable model (#48-8400-02) except instructions pertaining to installation.

The rack model is identified by the -01 suffix in the model number (i.e #48-8400-01); the portable model is identified by the -02 in the suffix of the model number.(i.e.#48-8400-02)

DESCRIPTION

The 8-Channel DC Amplifier, Model #48-8400-01/02, is a versatile self-contained unit, composed of eight identical isolated preamplifiers, powered from the AC line. (This model plugs directly into the power line, requiring no other power source.)

EXPLANATION . . . Amplifier vs. Attenuator

*An **amplifier** is a device that enables an input signal to control power from a source independent of the signal and thus be capable of delivering an output that bears some relationship to, and is generally greater than, the input signal; an **attenuator** is an adjustable transducer for reducing the a mplitude of a wave without introducing appreciable distortion*

The 8-Channel DC Amplifier features a 5 Khz bandwidth, output polarity control with LED indicator, AC/OFF/DC front-end coupling, a full-scale measurement range of 50 millivolts to 500 volts and a gain type sensitivity control that can interpolate any measured voltage between 20 millivolts and 500volts to produce a full scale voltage. **(Table 1-1)**

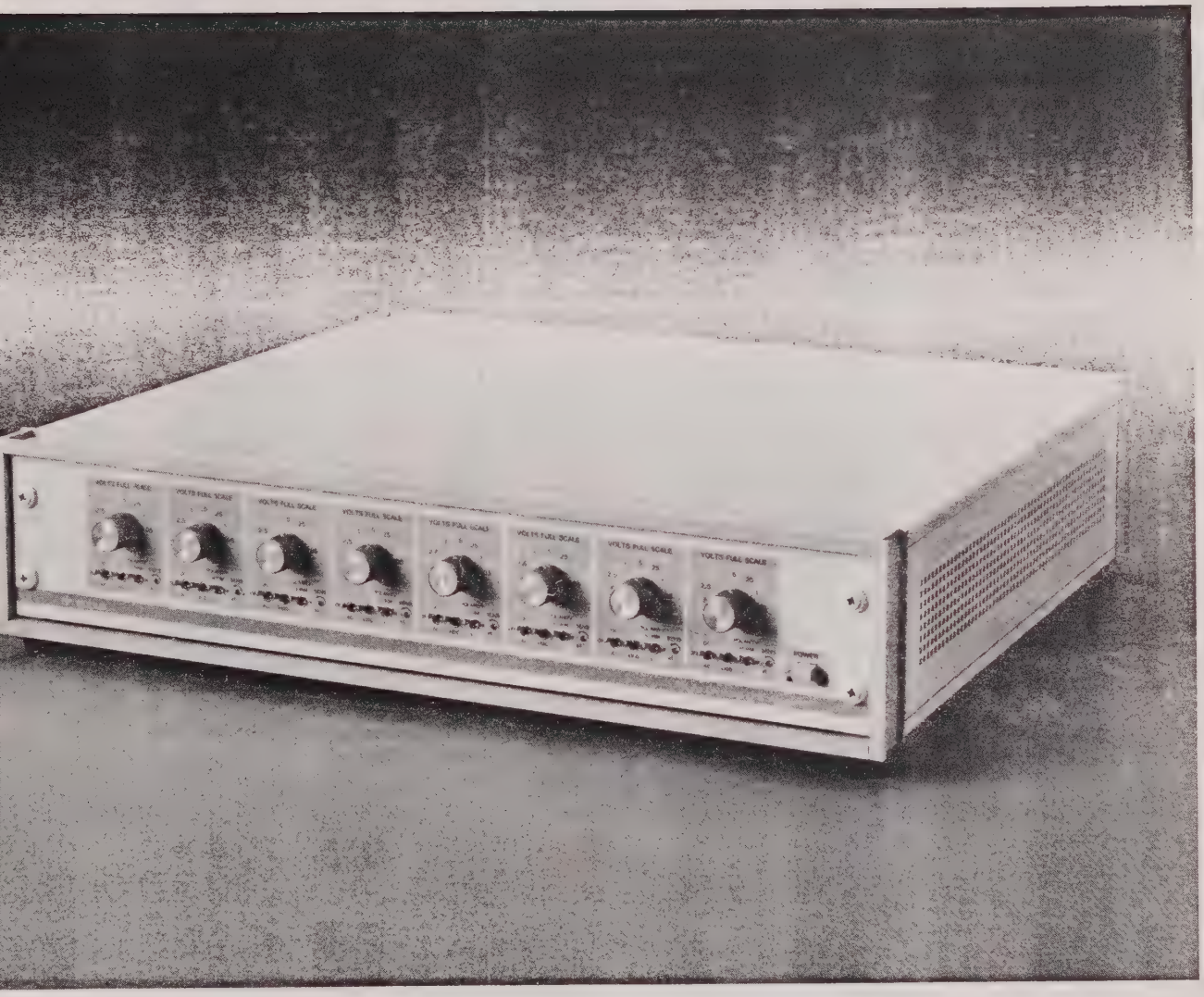

FIGURE 1-1
8-CHANNEL DC AMPLIFIER
MODEL NO. 48-8400-02 (Portable Case Model)

TABLE 1-1
QUICK REFERENCE DATA CHART

CATEGORY	Description
Sensitivity Range	50 mV to 500 mV (20 mV achieved via sensitivity control)
Frequency Response	5 kHz
Power Requirements	100/220 volt +/- 10% 50/66/440 Hz; total power required <30 watts
Environment Temperature Humidity	 Storage [-40° C to +70° C] Operating [0° to +50° C] Operating [50% rel.humidity, 0° to 50° C]
Options	addition of separate supply to deliver =12 volts at 1 Ampere as a CSP
Standards	meets IEC-348 specifications

Standard output full-scale voltage is 5volts peak, the voltage required to drive the Gould series of pen drive amplifiers. By means of a single plug-in resistor, any voltage up to 10 volts peak can be selected as the full-scale voltage. Thus, this DC Amplifier can be used in the telemetry industry where 10 volts peak is the usual full-scale voltage, as well as in tape recording applications where 1 volt rms is used as the full-scale voltage.

Terminology

Full Scale — *coarse gain control. When sensitivity switch is set extreme CCW(counter-clockwise) at x1 the full-scale switch is calibrated in volts*

Isolation Amplifier — *amplifier employed to minimize the effects of a following circuit on the preceding circuit, without galvanic connection between input and output.*

Preamplifier — *an amplifier connected to a low-level signal source to present suitable input and output impedances and provide gain so that the signal may be further processed without appreciable degradation in the signal-to-noise ratio*

Sensitivity — *control to allow variable gain in amplifier which can set (20mV to 500V) any incoming voltage to be a full-scale voltage in output device*

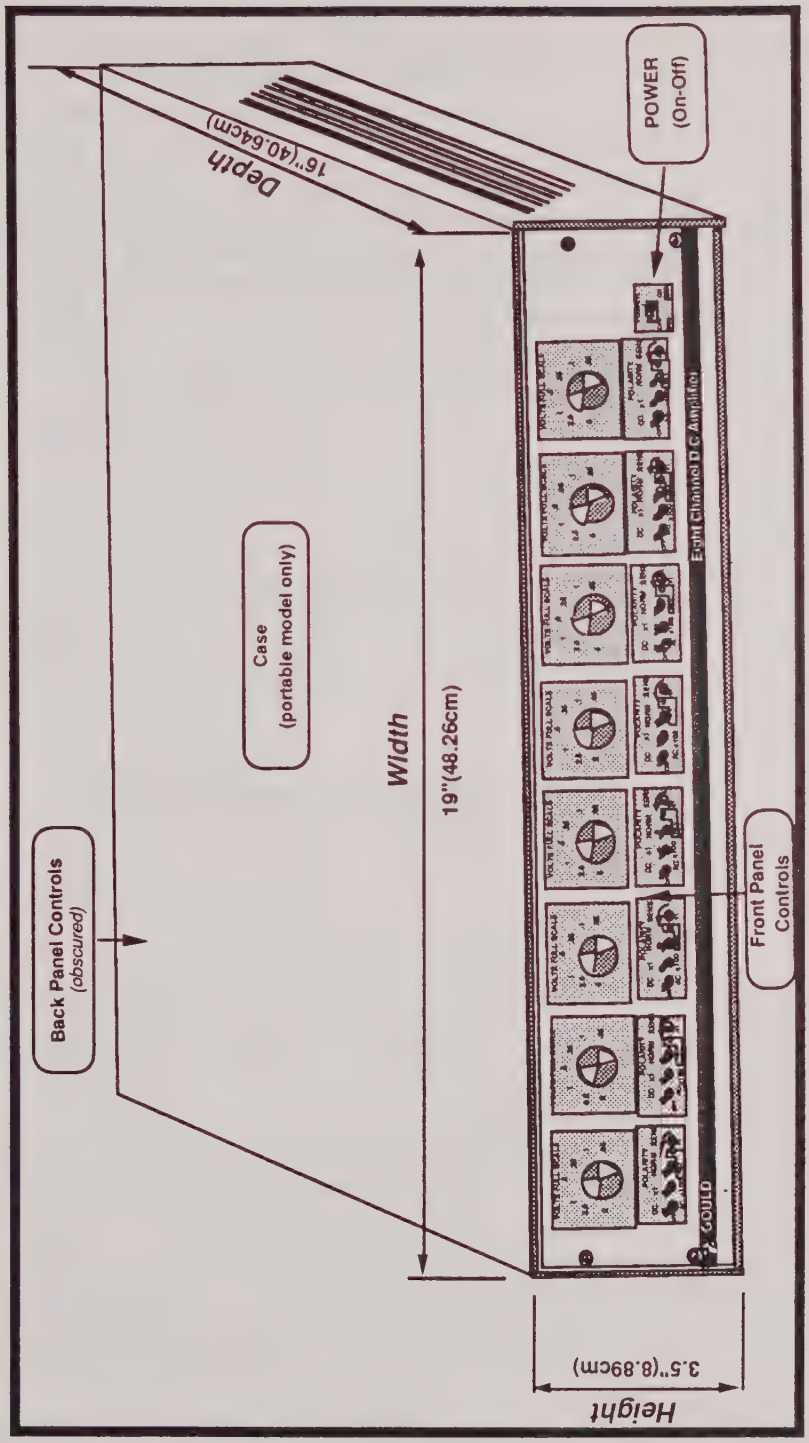

FIGURE 1-2
48-8400-01/02 DC AMPLIFIER
GENERAL FEATURES

TABLE 1-2
48-8400 DC AMPLIFIER
SPECIFICATIONS SUMMARY

Measurement Range 50 mV FS to 500V FS
Amplifier Input Circuit floating, single ended, referenced to individual amplifier isolated common; isolated common connected to chassis by 1000 pf, 2 Kv capacitorr
Input Impedance 1 megohm shunted < 150 pf
Output Impedance < 10 ohms, DC to 5 KHz
Noise 0.2% FS 0.1-10 Hz (RTI)
Inaccuracy +/- 0.25% of FS reading, exclusive of drift, at 5v FS
Non-linearity +/- 0.4% of full scale
Instability **Zero** With time: < 50 mV/24 hrs With temp: +/- 50 mV/c, RTI, measured at maximum gain With line: +/- 0.1% FS for 10% line change **Gain** With time: +/- 0.05%/1000 hrs With temp: +/- 0.02%/C With line: +/- 0.01% for +/- 10% line change
Frequency Response DC to 5 KHz minimum at -3dB (can be lowered by means of plug-in capacitor)
Environment Operating Temperature: 0°C to +50°C (32oF to 122°F) Storage temperature: -40°C to +70°C (-40°F to 158°F) Humidity: will operate within specification at 50%; RH, 0oC to 50oC
Power Requirements 110/220 volt +/-10%, 50/60/400 Hz total power required less than 30 watts
Physical Characteristics Weight: 10 lb (4.5kg) Dimensions: 3.1" H, 19" W, 16" D (8.89 cm H, 48.26 cm W, 40.64 cm D)

INSTALLATION

GENERAL

This section describes the inspections and checks that should be performed upon receiving the Gould 48-8400-01/02 DC Amplifier.

INITIAL INSPECTION

Before attempting any electrical connections or operation, visually examine the unit for any damage. Be certain to read the Concealed Damage Card, Form No. 222640, which is enclosed in the shipping carton.

CAUTION

REMOVAL OF COVER WILL EXPOSE LINE VOLTAGES WHICH ARE DANGEROUS !
DO NOT ALLOW UNTRAINED PERSONNEL TO REMOVE COVER.

REFER TO GOULD FIELD OFFICE FOR ALL SERVICE OR ADJUSTMENTS OF AMPLIFIER COMPONENTS.

CAUTION

Before installation or removal of the DC Amplifier, be certain that:

#1 The Power ON/OFF switch is set to OFF.
#2 The power cord is disconnected.
#3 All signal source lines are not connected to the unit.

INSTALLATION

Rack Mount Procedure

The 48-8400-01 DC Amplifier is suitable for installation into either the Standard or Tall Retma Cabinet. These vertical cabinets can accommodate instruments with a 19-in front-panel width, such as the DC Amplifier, when a Rack Mounted Kit Assembly is utilized.

This kit assembly contains supports, brackets, and necessary screws for securing the amplifier into a Retma cabinet. Installation of the rack-mounted model into a cabinet is not required for operation but recommended for convenient in use with other related instruments.

The DC Amplifier is completely self-contained; installation, therefore, involves simply securing the unit to the cabinet.

Portable Model (48-8400-02)

The 48-8400-02 DC Amplifier is a portable version of the Rack-Mounted Model 48-8400-01. The portable model is intended as a stand-alone for use without a rack cabinet.

The portable model differs from the rack model by containing features such as a different case covering the unit, with a carrying handle on one side, and rubber support tips on the base.

INPUT CONNECTIONS

The DC Amplifier can be used with any signal input up to 500 volts peak. The source may be floating or singled ended grounded. For signal input connections, use the special connector (Gould Part Number CL-211125-12).

Input Plug Connections (Table 2-1)

Refer to Figure 2-1a and 2-2 f or location of signal input connector.

TABLE 2-1
INPUT SIGNAL CONNECTOR

Input Signal Connector Mating Connector	8 each, CL-211126-12 8 each, CL-211125-12
Input Connector Pin	Pin #1 = Low Pin #2 = High

Use good quality cable; if high off ground voltages are encountered, use a well-insulated cable.

1. Attach center conductor to contact supplied in the shipping kit, and insert in pin #2 position of connector supplied.

2. The shield is similarly inserted into pin #1.

Signal Output Connections

Refer to Figure 2-1 and 2-2 for location of signal input connector.

A 37-pin D connector is used for the output signals. This connector is pin-for-pin compatible with the 3000 type recorder. The signals from the eight available channels terminate to specific pin assignments **(Table 2-2).**

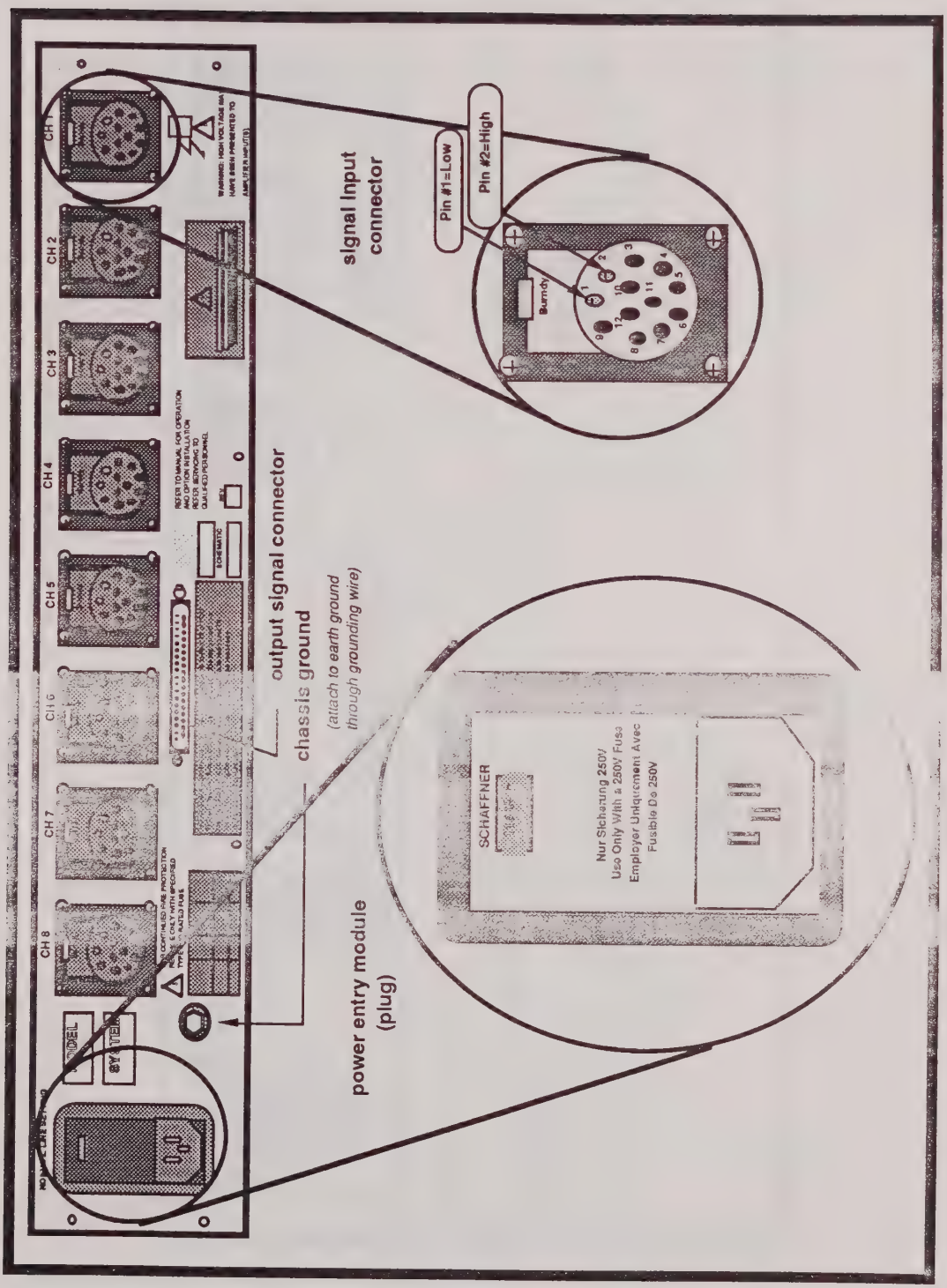

FIGURE 2-1
48-8400-01/02 DC AMPLIFIER

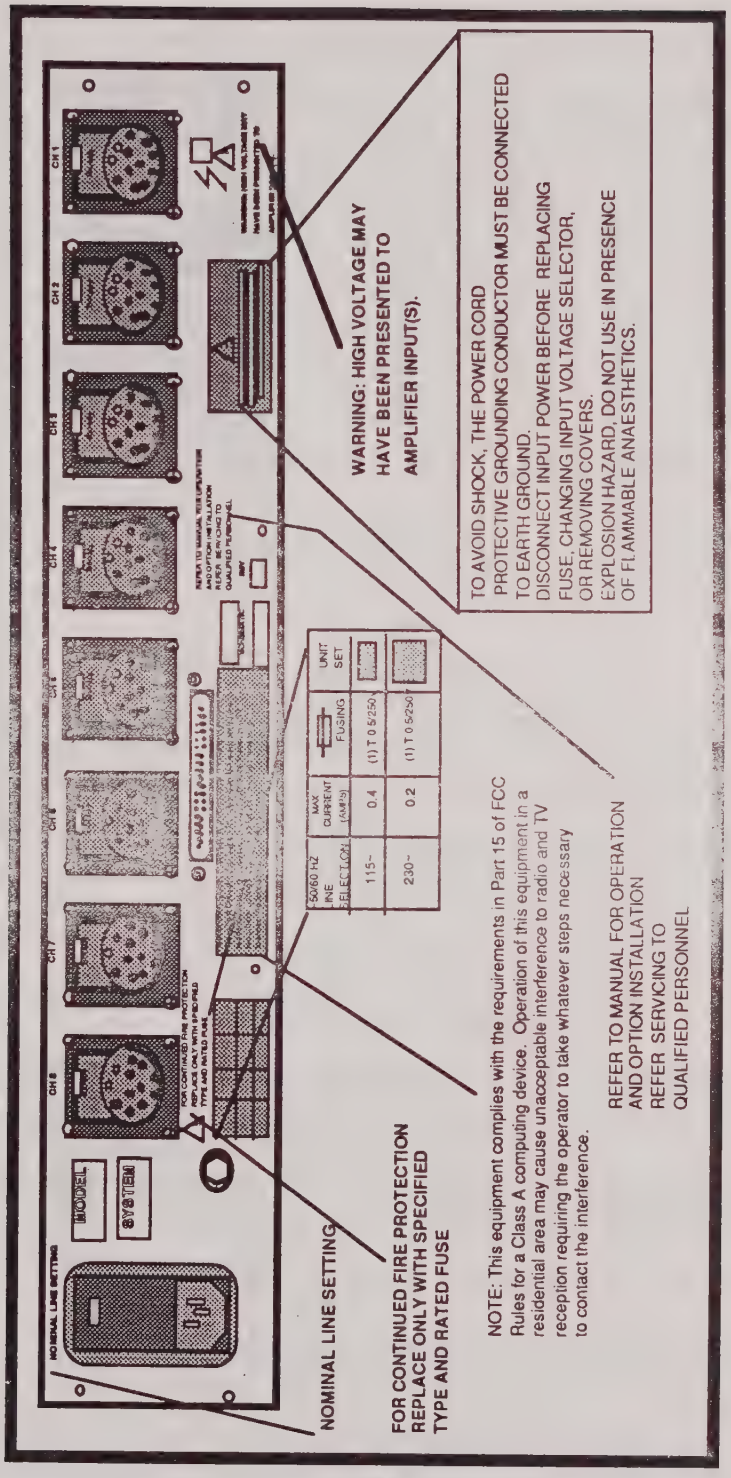
NOMINAL LINE SETTING
FOR CONTINUED FIRE PROTECTION
REPLACE ONLY WITH SPECIFIED
TYPE AND RATED FUSE
NOTE: This equipment complies with the requirements in Part 15 of FCC Rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps necessary to contact the interference.
REFER TO MANUAL FOR OPERATION AND OPTION INSTALLATION
REFER SERVICING TO QUALIFIED PERSONNEL
WARNING: HIGH VOLTAGE MAY HAVE BEEN PRESENTED TO AMPLIFIER INPUT(S).
TO AVOID SHOCK, THE POWER CORD PROTECTIVE GROUNDING CONDUCTOR MUST BE CONNECTED TO EARTH GROUND.
DISCONNECT INPUT POWER BEFORE REPLACING FUSE, CHANGING INPUT VOLTAGE SELECTOR, OR REMOVING COVERS.
EXPLOSION HAZARD, DO NOT USE IN PRESENCE OF FLAMMABLE ANAESTHETICS.
50/60 HZ LINE SELECTOR
MAX CURRENT (AMPS)
FUSING
UNIT SET
115~
0.4
(1) T 0.5/250
230~
0.2
(1) T 0.5/250
MODEL
SYSTEM
CH 8
CH 7
CH 6
CH 5
CH 4
CH 3
CH 2
CH 1

FIGURE 2-2
48-8400-01/02 DC AMPLIFIER
REAR PANEL INSTRUCTIONS

TABLE 2-2
OUTPUT SIGNAL CONNECTOR PIN ASSIGNMENTS

Channel #	Output Low Pin #	Output High Pin #
1	1	20
2	2	21
3	3	22
4	4	23
5	5	24
6	6	25
7	7	26
8	8	27
Output Signal Connector Is a 37 Pin D Connector (#297707-37)		

A mounting connector cord shell is supplied in the shipping kit. (A custom cable suitable for use with the Model 3000 recorder can be purchased from Gould Electronics. (Gould Part # CL-311222-1 Interface Cable).

TABLE 2-3
SUMMARY DATA: AMPLIFIER INPUT

CATEGORY	Description
Isolation	Input is isolated from the output, chassis & adjacent channels
Circuit	Floating, single ended, referenced to individual amplifier isolated common. Isolated common connected to chassis by 1000 pf, 2Kv capacitor
Impedance	1 Megohm shunted by less than 150 pf
Bias Current	Less than 75 picoamperes at 25^{O}C
Measurement Range	50 millivolts full scale to 500 volts full scale
Maximum Input Voltage	500 volts pk for 1 minute at x1
Dielectric Withstand	1200 volts rms input to other input or to output/chassis, test only. Normal voltage 500 v. RMS max.
Ranges	50mv, 100mv, 250mv, 500mv, 1v, 2.5, 5v plus x 100 range
Coupling	AC/OFF/DC Front Panel selectable (-3dB - 2Hz +/- 1 Hz at AC)
Range to Range Inaccuracy	+ or - 0.5% of full scale
Channel-to-Channel Crosstalk 1. Input switch at x1 2. Input switch at x100	 110dB down at 5KHz sine 75 dB down at 5 KHz sine

TABLE 2-4
SUMMARY DATA: AMPLIFIER OUTPUT †

CATEGORY	Description
Stability	stable with load of 2k ohms in parallel with 1000 pf
Circuit	single ended referenced to amplifiers(s) output common
Voltage	+/- 5 volts with 2k ohm load up to +/- 10 volts as CSP
DC Nonlinearity	0.4% of full scale
DC Inaccuracy	0.5% of FS reading, exclusive of drift, at 5v FS
Output Impedance	less than 10 ohms, DC to 5 KHz
Frequency Response	DC to 5 KHz minimum at -3dB; can be lowered by means of plug-in capacitor
Noise	0.2% FS 0.1-10 Hz (RTI)
CMR	90 dB at 60 Hz with 1 kohm unbalance (CMV applied between isolated common and chassis, at most sensitive range); 140dB at DC with 1kohm unbalance (CMV to have less than 100 microsec rise time)
Output Offset Voltage	< +/-15 mv at 25 ^{o}C

† All amplifiers share the same output and power common

OPERATION

GENERAL

This section describes and illustrates the functions of the front panel controls as they are used in the 48-8400-01/02 DC Amplifier. The section discusses in order the theory of operation followed by a description of the front panel controls and the operating instructions.

THEORY OF OPERATION

The theory of operation is discussed with respect to two areas:

- **circuitry;**
- **power supply.**

Refer to Figure 3-1 for clarification of general circuitry related to controls, input, and output.

Circuitry *(Refer to Figures 3-2 , System Block Diagram)*

The circuitry is simple and straightforward. The input signal arrives into a snap-in input connector from where it is routed to the input AC/OFF/DC switch S1 by means of a short coaxial cable. This is followed by a X1/x100 switch which extends the measurement range to 500 volts peak. Resistor Rx4 and zener diodes Crx1 and Crx2 protect the input of U1 from damage that can be caused by applying 500 volts to the input with the X1/X100 switch in the X1 position.

The main gain block of the amplifier chain is U1. Its gain is controlled by the full scale switch Sx3, which operates on a resistor network which is tightly controlled for resistor ratio match as well as temperature coefficient ratio match. All the required gain is taken here, with an additional gain of up to X2.5 taken in the output stage of U3 in conjunction with the sensitivity control. The offset voltage of the input stage U1 is cleared by means of Rx22.

U2 is the heart of the amplifier system. This is the isolator. It works as a pulse width modulator-demodulator. Capacitors Cx6 and Cx7 limit the bandwidth of the isolator but at the same time help to improve its linearity. The bandwidth is set for a 3db down point of at least 5 khz. The coupling of the pulse width modulated signal is done by means of very small monolithic capacitors embedded into the isolator structure. The isolator is capable of blocking 1500 volts, but other items such as the full-scale switch limit the voltage breakdown specification to 1200 volts rms. Potentiometer Rx9 clears the offset of the isolator and the following stages.

The first section of the U3 acts a simple gain of one inverter. Switch S4 selects either the output of the inverter (for positive output) or the output of the isolator (negative output). The final stage of U3 is used to set full-scale, by means of Rx14, and to do the sensitivity function by means of Rx17. Rx18 and Cx10 roll off the bandwidth of this stage and allow it to drive up to 2000pf in parallel with 2k without oscillations.

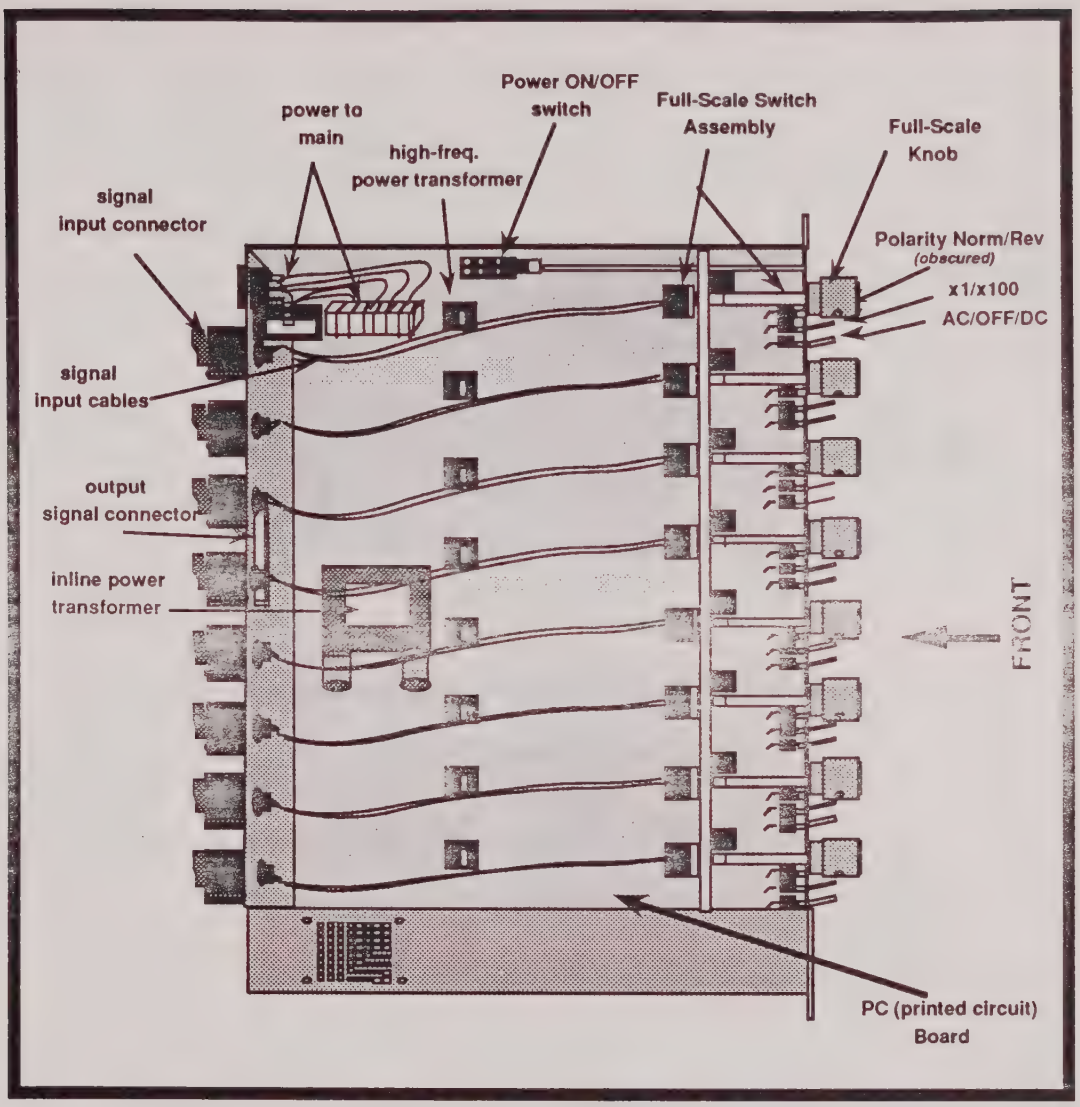

FIGURE 3-1
48-8400-01/02 DC AMPLIFIER
INTERNAL CIRCUITRY AND CONTROLS

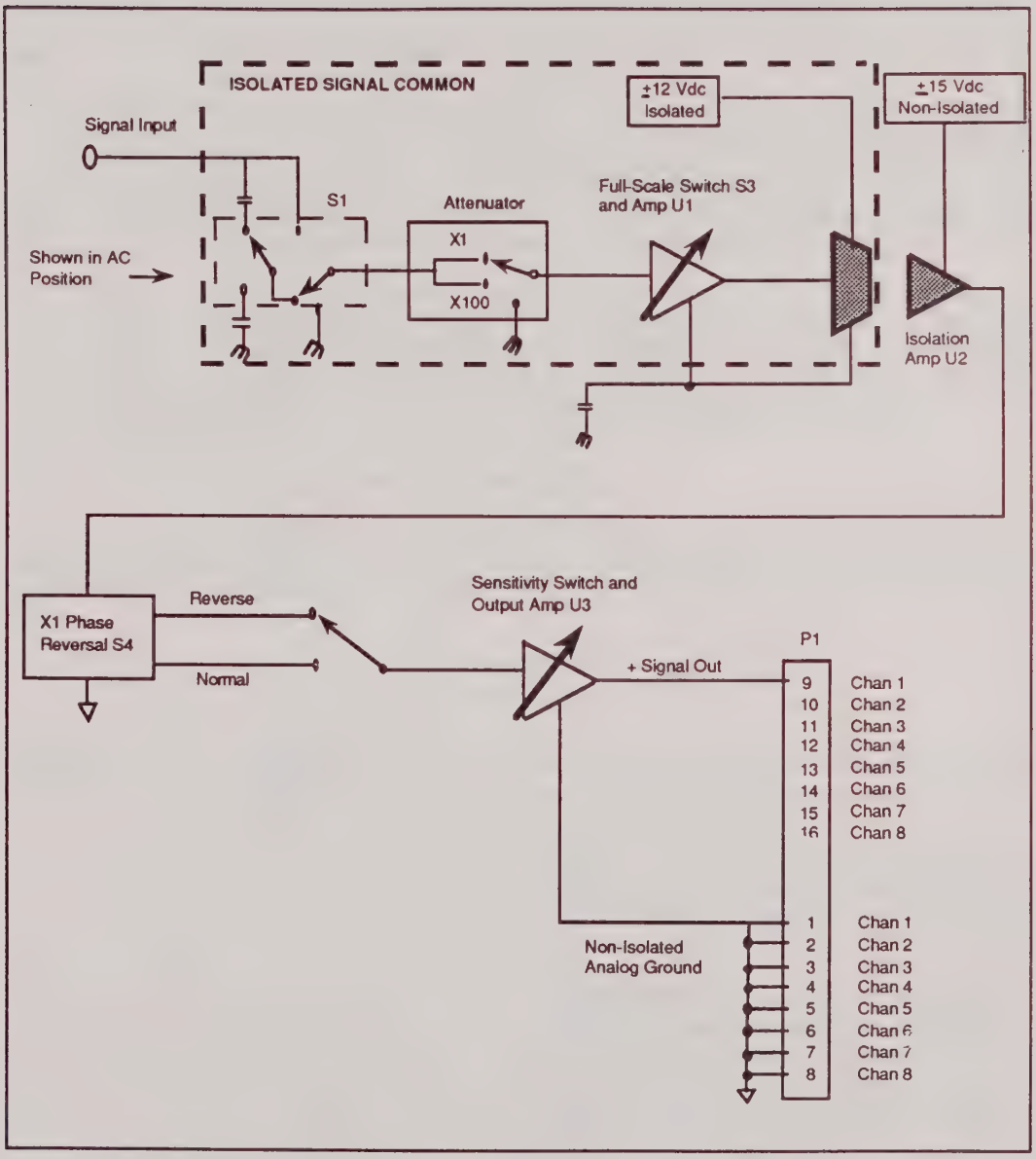

FIGURE 3-2
SYSTEM BLOCK DIAGRAM

Power Supply

The power supply starts off the line, where a step down transformer T1, drives a rectifier-filter-regulator system delivering +/- 15 volts and +12v. This power source supplies all the output sides of the amplifiers, which includes the output sides of the isolators and the Ux3s. All amplifiers share the same output common. This common is not connected directly to chassis to prevent forming a ground loop with the recorder ground. It is connected to chassis through R6, a 22 megohm resistor, and C18, a 0.01 mfd ceramic capacitor.

The +12 volt supply powers U1, the Oscillator-Driver. This drives transformers Tx1 (the x designation implies one is used for each channel) with a 300 khz square wave. The secondary of the Tx1s drive high-frequency rectifiers Crx3, which supply power to the isolated sections of each amplifier. Off of pin 3 of the Tx1, Rx11 drives the synchronizing input of the isolator. Thus, all isolators are driven at the same frequency and phase, preventing possible beat frequency effects that would occur if each isolator runs its internal pulse width converter at a random rate.

The PC board of this assembly contains an area where an identical power transformer can be inserted, driving a similar rectifer-filter-regulator combination. This can deliver +12 volts to the input connectors, to be used as transducer excitation power, at up to 1 Ampere total current. If a bipolar power is necessary, -12volts can also be produced here. The total current drawn from these two voltages must be less than 1 Ampere. This feature is to be implemented by CSP. Only the area and the PC board connections are provided in the standard unit.

DESCRIPTION OF FRONT PANEL CONTROLS

The front panel of the 8-Channel DC Amplifier contains eight sets of identical controls of six items, one set for each of the eight channels. In addition, the unit contains two additional items related to activating the power source. The item numbers in Table 3-1 correspond to the items in Figure 3-3.

TABLE 3-1
FRONT PANEL CONTROLS

Item No.	Control	Description
1	**VOLTS FULL SCALE**	7-position rotary switch for selection of volts(5, 2.5, 1, .5, .25, .1, .05) for coarse-gain control. {When sensitivity is set at extreme counter-clockwise position (x1) the full-scale switch is calibrated in volts.}
2	**DC/OFF/AC**	toggle-switch, 3 position that permits each channel to operate in the DC(direct current), AC(alternating current) or be turned OFF.
3	**x1/x100**	toggle-switch, 2 position; multiplies full-scale switch by 100
4	**POLARITY NORM/REV**	toggle switch, 2-position; reverses polarity of output signal (LED "On" indicates reverse polarity)
5	**LED** (indicator light)	Reverse Polarity Indicator; illuminated indicates reverse polarity

TABLE 3-1 (Cont)
FRONT PANEL CONTROLS

Item No.	Control	Description
6	SENS/x1	screwdriver adjustable for sensitivity; increases gain by up to 2.5x, except @500v FS setting; x1 position is at extreme CCW
7	POWER ON/OFF	push button for activating unit power supply; depressed is ON, relieved is OFF
8	Power LED (indicator light)	Power indicator; illuminated indicates power is ON

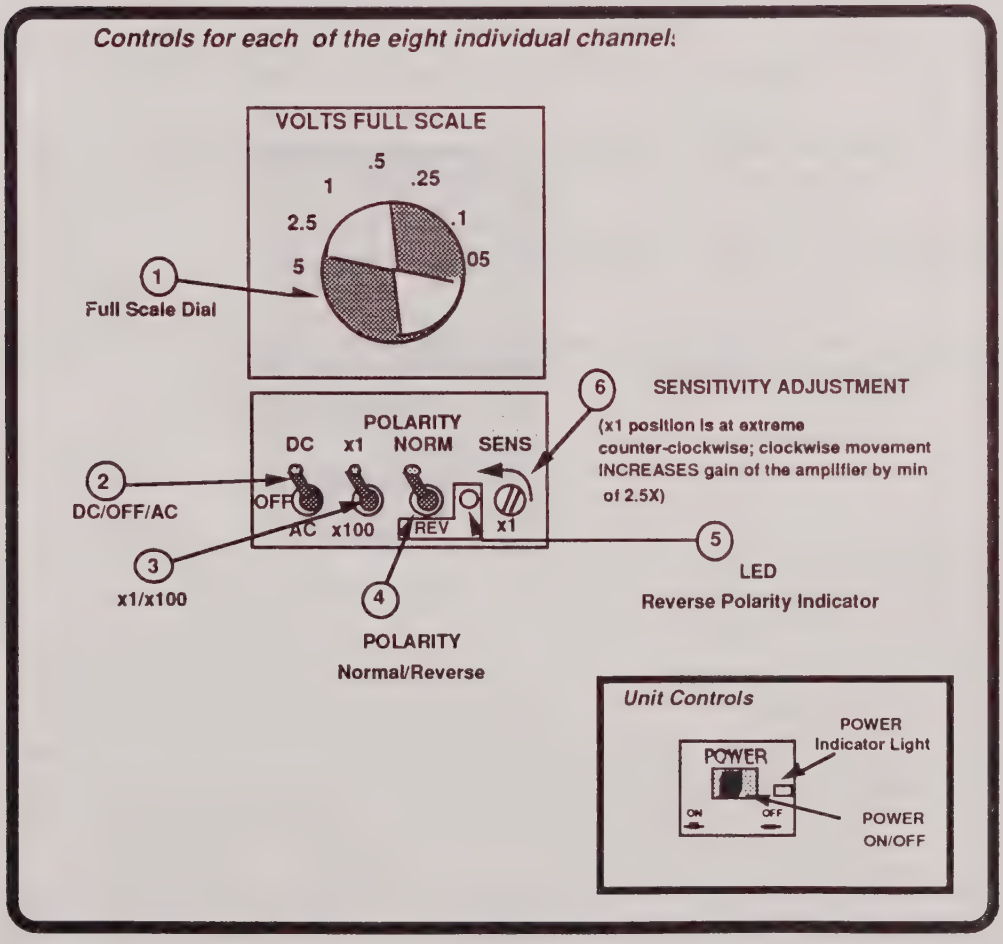

FIGURE 3-3
FRONT PANEL CONTROLS

Preliminary Operation *(assumes using recorder in conjunction with Amplifier)*

1. Set controls for all channels in use as follows:

Initial set-up

Full-Scale	to	**5 V**
AC/OFF/DC	to	**OFF**
x1/x100	to	**x100**
Polarity	to	**Normal**
Sensitivity	to	**extreme (detent) counterclockwise(CCW)**

2. Turn on recorder at some convenient low speed and adjust pen position to desired point.

3. Turn AC/OFF/DC switch to DC and bring in desired signal. (For best low noise operation, use the settings in DC mode. Refer to step 5 for AC operation and other options.)

4. Turn on the recorder and adjust Full-Scale switch and/or x1/x100 switch for in range viewing on chart recorder.

NOTE: Signals up to 500 volts peak can be accepted. Signals as low as 20mV peak can be made full-scale at the recorder by use of the sensitivity control. (*Refer to* **Adjusting Sensitivity**.)

5. Set other controls according to specific options:

If AC is desired on top of large static DC voltage	**then set AC/OFF/DC in AC position**
If polarity reversal is desired	**then set Polarity switch to REVerse**

6. For unused channels, set the controls as follows:

Unused channels

Full-Scale	to	**5 V**
AC/OFF/DC	to	**OFF**
x1/x100	to	**x1**
Polarity	to	**Normal**
Sensitivity	to	**extreme (detent) counterclockwise(CCW)**

Sensitivity Control

The sensitivity control for the 48-8400-01/02 performs a *gain* function. Any input voltage between 20mV and 500V peak can be adjusted to appear as full-scale output voltage.

1. Set sensitivity control to detent, at extreme counter-clockwise position.

2. Bring in desired signal at 100%.

3. Set AC/OFF/DC switch to OFF.

4. Set pen position on chart to desired point.

5. Set AC/OFF/DC to DC. (Use AC if a large unwanted DC component exists on the input, and the desired signal is varying at rate of over 2 HZ.)

6. Use x1/x100 control and Full-Scale switch to put the pen at **less** than the desired 100% point on the chart. (Use x1 for any signal less than 5 volts.)

NOTE: At this point all stages in the amplifier chain are running at less than 5 volts peak, well below the limit of the supply voltages.

7. Using a small flat-blade screwdriver, advance sensitivity control clockwise and adjust until pen reaches desired 100% point on chart.

MAINTENANCE

INTRODUCTION

This section describes the preventive maintenance that should be performed on the 48-8400-01/02 DC Amplifier. If the DC Amplifier is used in a dusty or dirty environment the maintenance periods should be more frequent (e.g. perhaps every three months). If the unit requires repair, refer to the service manual on the 48-8400-01/02 or consult your Gould Service Representative. A full statement of Gould Warranty and a list of Gould's Sales and Service Offices concludes the section.

CLEANING

Front Panel

Wipe off the front panel including the controls with a damp rag using a mild diluted soap. Then wipe clean with a water-soaked rag. Allow the panel and controls to thoroughly dry before placing the unit in operation.

Input Connector

Clean the pins and inside the connector with isopropyl alcohol (90% alcohol content). A damp rag with mild diluted soap may be used on the outside of the connector. Then wipe clean with a water-soaked rag Allow the connector and pins to air dry completely.

Internal Circuitry

CAUTION

REMOVAL OF COVER WILL EXPOSE LINE VOLTAGES WHICH ARE DANGEROUS !
DO NOT ALLOW UNTRAINED PERSONNEL TO REMOVE COVER.

REFER TO GOULD FIELD OFFICE FOR ALL SERVICE
OR ADJUSTMENTS OF AMPLIFIER COMPONENTS.

REPLACING A FUSE

CAUTION

ALWAYS REMOVE POWER LINE CORD WHEN ADJUSTING OR SERVICING UNIT !

1. **Remove the line cord from the input power module.**
2. Use a screwdriver to pry open the fuse cover.
3. Carefully remove the fuse holder, noting the direction of its position in the power input module..
4. Replace the fuse.
5. Replace the fuse cover by snaping into the power input module.
6. After cover is snapped in, the line cord can be reinserted into the power input module.

WARRANTY

CURRENT EQUIPMENT

Gould Inc., Recording Systems Division's products as shown in the Current Equipment Catalog are warranted for a period of one year from date of shipment to original purchaser. Exceptions: The IBM PC-XT computer for Data Acquisition Systems (DASA) and their associated software programs are warranted for 90 days. The IBM PC-AT computer is warranted for one (1) year.

Gould's products are warranted to conform to the applicable published specifications in effect at the time of shipment, and to be free from any defects in material or manufacture when used with recommended Gould associated equipment and Gould chart paper. GOULD'S LIABILITY UNDER SUCH WARRANTY IS LIMITED TO SERVICING OR REPLACING DEFECTIVE PARTS EXCEPT PENS, STYLI, FUSES AND BATTERIES AND DOES NOT INCLUDE CALIBRATION AND MINOR MAINTENANCE AS OUTLINED IN GOULD OPERATING MANUALS. IN NO EVENT SHALL GOULD BE LIABLE UNDER CONSEQUENTIAL OR SPECIAL DAMAGES. All products are to be returned transportation prepaid by the buyer. Gould reserves the right to determine the cause and existence of a defect under this warranty and this warranty shall not apply to any products which have been subjected to misuse, improper installation, repair, alteration, neglect, accident, inundation, fire or operation outside their published maximum ratings.

THE FOREGOING WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS AND OF ANY OTHER OBLIGATION AND SHALL CONSTITUTE THE SOLE REMEDY OF THE BUYER AND SOLE LIABILITY OF GOULD.

Gould offers an Extended Warranty Agreement for all its products, along with calibration traceable to NBS. Please contact the Service Center listed on the following pages for details before your warranty expires.

REPLACEMENT PARTS

Warranty is same as above except ninety (90) days from date of shipment. **Gould** instruments are individually tested and calibrated before shipment to assure dependability and verify their accuracy. To this procedure must be added an unseen ingredient of prime importance to you: the Gould concept of continuing service. Gould responsibility for each instrument sold covers far more than its delivery. Of equal concern is the equipment's suitability for its intended purpose, its correct installation, instruction of operating personnel -- plus future servicing and maintenance. The Gould Field Service Department offers customers any or all of these services:

Field Service

Installation
Field maintenance
NBS Certification

Training

Instruction of operators
On-site training seminars
Formal Training courses

WARRANTY

Service Contracts

Fixed Fee
Time and Material
Extended Warranty

Our Seal of Pride

Gould Inc., Recording Systems Division and its predecessor organizations tracing back to Charles F. Brush, have been preeminent in instrumentation development since the 1920s. Among Gould's many achievements is a series of the world's best performing, most versatile, and reliable direct writing recording systems.

Today, Gould recorders and signal conditioners are the overwhelming choice for recording analog signals in the most critical industrial, scientific, and biophysical measurement applications. Whether recording the faintest life signals of a patient in a hospital operating room or the most critical variables in the laboratory or on the production line, you can depend on the accuracy, faithfulness, clarity, and permanence of the traces made by Gould MK200A System. Innovative design, coupled with highest quality, are hallmarks of all Gould products.

The Field Service Engineer

Gould field service engineers provide on-the-spot assistance whenever and wherever it is required. While every field service engineer is the product of intensive and thorough factory training, you will find that his greatest strength evolves from field experience and his knowledge of your objectives. He is aware of your problems, is willing and able to assist you in their solution, and is backed by the nation's most experienced organization in recording instrumentation.

Our field service engineers and technicians are daily engaged in the installation, testing, maintenance, repair and inspection of Gould recording systems all over the country. They can provide you with any information about our instruments you may require; if not, they will find the answer to your problem.

Overhaul and Repair

Because we service only our own products, our customers can feel confident of prompt, effective results when they turn to Gould Factory Service Centers.

The repair service these centers provide is of particular appeal to those companies that do not operate an instrument repair facility of their own. By designating the nearest Gould Service Center as its maintenance depot, a Gould-equipped company is assured the best chance for continuity of recording instrumentation.

Many companies with their own repair facilities find it more convenient and more truly economical to have their Gould equipment repaired by service contract with the closest Service Center. In addition to enjoying fast turn-around, these companies are spared the expense of carrying an inventory of recorder parts, accessories, and supplies.

WARRANTY

Calibration and Certification

A small, quiet room in the Standards and Calibration Section at the Gould plant in Cleveland contains precision reference standards just one step removed from the prime reference measurement standards of the United States - at the National Bureau of Standards in Washington. Included in this room, which is temperature-controlled within one degree and has a constant relative humidity of 40%, are standards for voltage, frequency (derived from the atomic vibration of caesium), resistance, capacitance -- in fact all basic parameters of electrical measurement. The room is maintained under stabilized conditions 365 days a year.

The calibration practice of all Gould Service Centers is directly traceable to the National Bureau of Standards. We can supply complete calibration for any Gould equipment, and we can also certify to manufacturer's specifications followed by a letter of certification when required.

Training

The Gould field service engineer will hold short training courses either on the job or at his facility. On-the-job training is usually a brief, informal session with the people who will actually be operating the Gould equipment.

Formal classroom training is more complete: detail information, a thorough review of underlying theory, training devices, demonstration of problem solving and examination of students to determine their understanding and proficiency is accomplished at our Cleveland plant.

Contracts

Companies of customers requiring temporary or permanent service are afforded contractual arrangements by which agreed-upon maintenance, repair upgrading and calibration services are performed on a routine basis. Service contracts are now in effect with a number of customers, affording substantial saving in time and money.

Owing to the various requirements of each customer, we do not reproduce here a standard, boilerplate agreement -- which might contain too much or too little. Instead, we tailor each contract to a particular customer's needs. This practice has single handedly produced substantial savings in time and money for others; and it can do the same for you.

An extended warranty is available at the point of sale allowing a regulated budget for the first two years of ownership. You may take advantage of this warranty within the first year of ownership at a percentage of the current listed price.

GOULD INC., TEST & MEASUREMENT
SALES AND SERVICE DIVISION OFFICES

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Phoenix
1525 N. Hayden #4
Scottsdale, AZ 85257
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FAX: (602) 941-4730

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Los Angeles
16310 Arthur Street
Cerritos, CA 90701
Phone: (213) 404-1919
FAX: (213) 404-1635

San Francisco
19050 Pruneridge
Cupertino, CA 95014
Phone: (408) 864-7733
FAX: (408) 988-1647

COLORADO

Denver
8480 East Orchard Road
Suite 2000
Englewood, CO 80111
Phone: (303) 741-4600
Service Office only

DISTRICT OF COLUMBIA

Washington (Medical)
6301 Ivy Lane, Suite 106
Greenbelt, MD 20770
Phone: (301) 345-0050
FAX: (301) 345-2850

FLORIDA

Orlando
774 North Lake Blvd., #1000
Altamonte Springs, FL 32701
Phone (407) 830-0695

GEORGIA

Atlanta
5300 Oakbrook Parkway
Suite 330
Norcross, GA 30093
Sales: (404) 279-1652
Service: (404) 279-2043
FAX: (404) 925-8202

HAWAII

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EMC Corporation
2979 Valena Street
Honolulu, HI 96819
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40 Gould Center
Rolling Meadows, IL 60008
Sales: (312) 640-4135
Service: (312) 640-4378
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MASSACHUSETTS

Boston
Middlesex Technical Center
216 West Cummings Park
Woburn, MA 01801
Phone: (617) 938-0133

MICHIGAN

Detroit
32307 Mally Road
Madison Heights, MI 48071
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FAX: (313) 588-4461

MINNESOTA

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620 Mendelssohn, Suite 199
Mineapolis (Golden Valley),
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FAX (612) 544-9361

NEW MEXICO

Albuquerque
P.O. Box 13494
Albuquerque, NM 87192
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NEW YORK

Metropolitan New York
405 Murray Hill Parkway
East Rutherford, NJ 07073
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FAX: (216) 881-4256

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432 Windsor Park Drive
Centerville, OH 45459
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FAX: ((213) 433-2764

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585 Rugh Street, Suite A
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WASHINGTON

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Gould Electronics SA
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